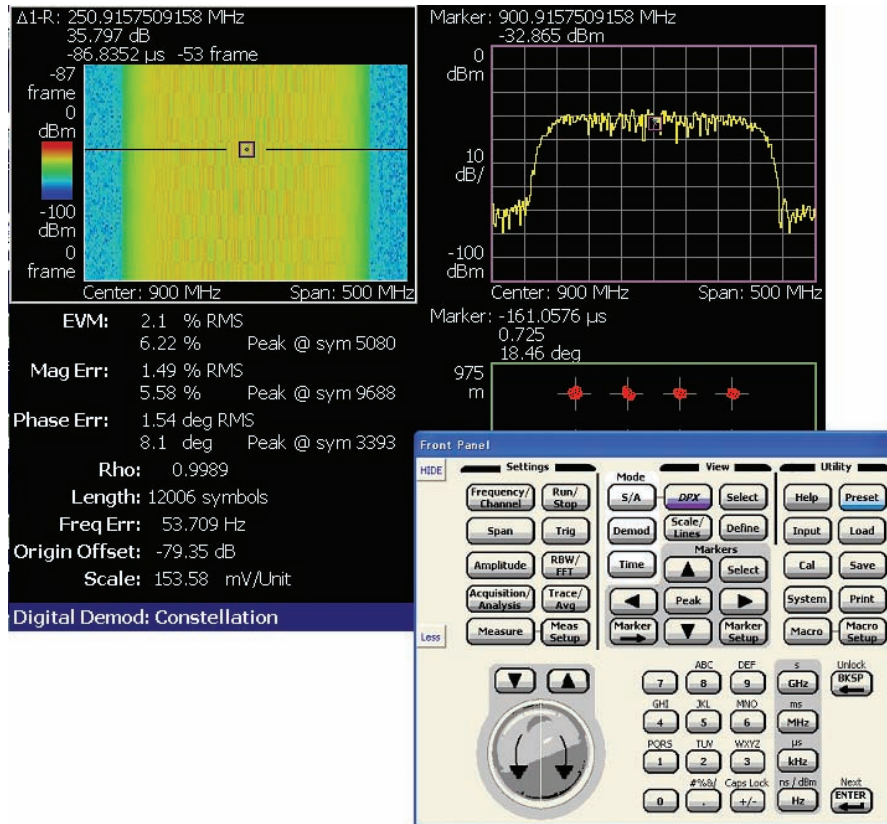


# Real-Time Spectrum Analyzer Software for RTSAs, Oscilloscopes and Logic Analyzers

► RSAVu (RSA6000A, RSA3000 Series RTSAs, DSA/DSO 70000 Series and TLA 5000/7000 Series)



## ► Features & Benefits

- Offline Signal Analysis
- Multi-domain Analysis Enables Fast, Complete Signal Analysis in Frequency, Time, Code, and Modulation Domains
- Complete Analysis for Acquisition Rates as Fast as 50 GS/Sec with Oscilloscopes
- Pulse Measurements including Pulse Width, PRI, Pulse-to-Pulse Phase, Pulse power
- General Purpose Digital Modulation Analysis for a wide variety of modulation types
- RFID Interrogator and Response Analysis
- Signal Source Analysis Simplifies Phase Noise, Jitter, and Frequency Settling Measurements
- Easy Analysis of IEEE 802.15.4 (Zigbee) Measurements
- C4FM modulation analysis for Project 25 Compliance Measurements\*1
- 3G Measurement Versatility with W-CDMA, cdma2000, 1x EVDO, HSUPA, HSDPA, RF and Modulation Analysis
- 802.11a/b/g/n Measurement Suite

Programmatic Interface (With RSAVu on an External PC)

- Integrate with Test Executive for Automated Compliance and Stress Testing
- Access Measurement Results via GPIB/LAN
- Batch Process Data Files Without Being Connected to Acquisition Hardware

\*1 Measurement performance for RSA3408A only.

## ► Applications

Very Wideband Signal Analysis Using Oscilloscope Acquisitions

W-CDMA

HSUPA

HSDPA

GSM/EDGE

CDMA2000 1x

CDMA2000 1xEV-DO

RFID

Phase Noise

Jitter

IEEE 802.11 a/b/g/n WLAN with MIMO

IEEE 802.15.4 OQPSK (Zigbee)

P25 (C4FM signal analysis)

Digital Modulation Analysis

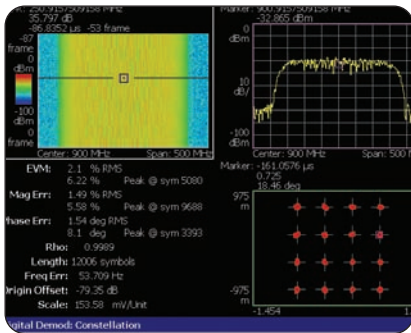
## Offline Analysis Software for RSA6000, RSA3000 Series RTSAs, DSA/DSO 70000 Series Oscilloscopes and TLA5000/7000 Logic Analyzers

RSAVu software enables offline analysis of data captured from Tektronix Real-Time Spectrum Analyzers (RTSAs), oscilloscopes and logic analyzers. The software offers users the same demodulation and analysis capabilities included in the RSA3408B software option suite. From 3G wireless standards to the latest RFID formats and pulsed-signal analysis, RSAVu is a tool designers can use to analyze signals without having acquisition hardware connected. The software supports data files saved on the RSA6106A, RSA6114A, RSA3408A/B, RSA3308A/B and RSA3303A/B Real-Time Spectrum Analyzers, DSA/DSO70000 series oscilloscopes with option UWB, and TLA 5000/7000 Logic Analyzers are both supported when files are saved in .iqt format.

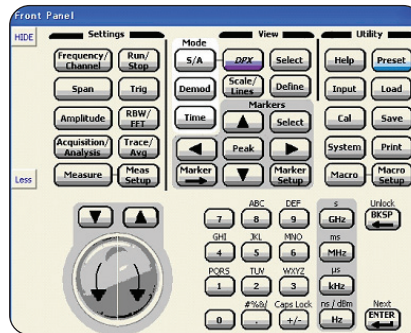
RSAVu can be installed and manually operated directly on the instrument. When used on an external PC, RSAVu supports a remote interface for performing data analysis in an automated test environment. Users can programmatically load RSA data files and extract analysis parameters using their test software to minimize time required for conformance and stress testing.

# Real-Time Spectrum Analyzer Software for RTSAs

► RSAVu (RSA600A, RSA300 Series RTSAs, DSA/DSO 7000 Series and TLA 5000/7000 Series)



► Oscilloscope capture of 312.5 MSymbols/sec 16 QAM signal, analyzed with RSAVu.



► The RSAVu soft front panel allows easy offline access to settings and controls.

## ► Characteristics

Sampling rates, dynamic range, accuracy and memory depth of the analysis is instrument-dependent as shown in the table below.

Supported Instrument / Characteristics*1	RSA3303/ RSA3308	RSA3408	RSA6106A/ RSA6114A	DSA/DSO70000
Frequency Range	DC – 3/8 GHz	DC – 8 GHz	9 kHz – 6.2/14 GHz	DC – Up to 20 GHz
Analysis Bandwidth	15 MHz	36 MHz	Up to 110 MHz	Up to 20 GHz
Sampling Rate, Maximum	51.2 MS/sec	102.4 MS/sec	Up to 300 MS/sec	Up to 50 GS/sec
Memory Depth (max) Memory Depth, seconds (at maximum sampling rate)	256 MB 2.56 sec	256 MB 1.28 sec	1000 MB 1.28 sec	200 MB X 4 channels 4ms @ 50 GS/s
Spectrum Analysis Spurious Free Dynamic Range	-70 dBc	-73 dBc	-73 dBc	<-40 dBc
Residual EVM, typical (1.6 GSymbol/sec QPSK, 2 to 16 GHz Carrier Frequency)	NA	NA	NA	<1.5%
Residual EVM, typical (4 Msymbol/sec QPSK, 2 GHz Carrier Frequency)	<2%	<0.6%	<0.6%	<1%

\*1 Typical or representative performance. See individual data sheets for more complete specifications. Memory depth refers to available acquisition-instrument memory. RSAVu can accept waveforms as large as the available instrument memory. RSAVu analysis length maximum is 64 MSamples.

## ► Measurement Functions in the Base RSAVu Software

**Note:** available as a free download.

Measurement Mode	Measurements and Displays
Spectrum	Operates on recalled spectrum traces. Channel Power, Adjacent Channel Power, Occupied Bandwidth, Emission Bandwidth, Carrier-to-Noise Ratio, Carrier Frequency, Spurious Search, dBm/Hz Marker, dBc/Hz Marker
DPX™	Spectrum Trace and DPX™ Bitmap recall
RTSA Mode	Channel Power, Adjacent Channel Power, Occupied Bandwidth, Emission Bandwidth, Carrier-to-Noise Ratio, Carrier Frequency, Spurious Search, dBm/Hz Marker, dBc/Hz Marker
RTSA with Zoom	dBm/Hz Marker, dBc/Hz Marker
Analog Mod. Analysis	IQ vs. Time, AM Depth, FM Deviation, PM, Pulse Spectrum
Time	IQ vs. Time, Power vs. Time, Frequency vs. Time, CCDF, Crest Factor
Pulse	Pulse Width, Peak Power, Ripple, Pulse Repetition Interval, Duty Cycle, Pulse-to-Pulse Phase, Frequency Deviation, Channel Power, OBW, EBW

## ► Measurement Functions and Specifications Available with RSAVu Options

Options allow you to extend the analysis capabilities of RSAVu to include general purpose and applications-specific modulation analysis. The following measurement characteristics apply to both the RSA3000A and RSA6000A series Real-Time Spectrum Analyzers.

### Opt. 21 – Advanced Measurement Suite Software

Modulation Formats	BPSK, QPSK, OQPSK, $\pi/4$ – DQPSK, 8PSK, D8PSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, GMSK, GFSK, ASK, FSK, DSB-ASK, OOK, PR-ASK, SSB-ASK, Subcarrier OOK, Subcarrier BPSK, C4FM (Fixed symbol rate and span). Coding format varies with modulation type
Parameter Presets	PDC, PHS, NADC, TETRA, GSM, CDPD, Bluetooth, IEEE 802.15.4 OQPSK (Zigbee), C4FM (Project 25)
Vector Diagram Display Format	Symbol/Locus Display, Frequency Error and OriginOffset Measurement
Constellation Diagram Display Format	Symbol Display, Frequency Error and OriginOffset Measurement
Eye Diagram Display Format	I/Q/Trellis Display (1 to 16 symbols)
Error Vector Diagram Display Format	EVM, Magnitude Error, Phase Error, Waveform Quality ( $\rho$ ), Frequency Error and OriginOffset Measurement
Coding Format	Miller, Modified Miller, Miller (M_2), Miller (M_4), Miller (M_8), Manchester, NRZ, direct-phase, grey and RFID-specific coding. Coding format availability varies with modulation format
Symbol Table Display Format	Binary, Octal, Hexadecimal
Signal Source Analysis	Phase Noise, Jitter, and Frequency Settling Measurement

### RFID Standards

- ISO/IEC 18000-7
- ISO/IEC 18000 Part 6 Type A, B, C
- ISO/IEC 18000 Part 4 Mode 1
- ISO/IEC 18092 (424k)
- ISO/IEC 15693
- ISO/IEC 14443 Part 2 Type A, B
- EPC Global Generation 1 Class 0, Class 1

### Digital Demodulation

GMSK (1 MHz Span)	EVM $\leq$ 1.8%, Magnitude Error $\leq$ 1.2%, Phase Error $\leq$ 1.0°
64QAM, 5.3 MS/s 1 GHz Carrier (15 MHz Span)	EVM $\leq$ 2.5% (typical)
QPSK, 3.84 MS/s 2 GHz Carrier (15 MHz Span)	EVM $\leq$ 2.5% (typical)

### QPSK EVM (%), Typical

Characteristics	RSA6000A	RSA3408A/B	RSA3300A/B
QPSK EVM CF = 2 GHz (typical value)	0.5% (at 100 kS/s)	0.5% (at 100 MS/s)	0.5% (at 100 kS/s)
	0.5% (at 1kS/s)	0.5% (at 1 MS/s)	0.5% (at 1 MS/s)
	0.6% (at 4 MS/s)	0.6% (at 4 MS/s)	1.2% (at 4 MS/s)
	0.9% (at 10 MS/s)	0.9% (at 10 MS/s)	2.7% (at 10 MS/s)

# Real-Time Spectrum Analyzer Software for RTSAs

► RSAVu (RSA600A, RSA300 Series RTAs, DSA/DSO 7000 Series and TLA 5000/7000 Series)

## Opt. 24 - GSM/EDGE Analysis Software

**Burst Type:** Normal

Characteristics	Description
<b>Modulation Measurement Accuracy</b>	
Carrier Power Range	-30 to +30 dBm
Phase Error Measurement Accuracy for GMSK Modulation (typical)	≤0.8° (RMS) 1.8° (Peak)
Phase Error Resolution	0.01°
EVM Measurement Accuracy for 8-PSK Modulation (typical)	≤0.9% (RMS)
EVM Resolution	0.01%
Time Resolution	0.15625 μs at 5 MHz span
Burst Count	1000 maximum
<b>Mean Power Measurement</b>	
RF Input Range	-50 dBm to +30 dBm
Absolute Power Measurement Accuracy for GSM900 at 20 °C to 30 °C, Excluding Mismatch Error (typical)	±0.5 dB, Signal frequency: 880 MHz to 960 MHz, Signal power: +10 dBm to -30 dBm, RF attenuator: 0 dB to 20 dB, after auto level is performed at 5 MHz span
Absolute Power Measurement Accuracy for DCS1800/PCS1900 at 20 °C to 30 °C, Excluding Mismatch Error (typical)	±0.6 dB, Signal frequency: 1710 MHz to 1990 MHz, Signal power: +10 dBm to -30 dBm, RF attenuator: 0 dB to 20 dB, after auto level is performed at 5 MHz span
Resolution	0.01 dB
Burst Count	1000 maximum
<b>Power Versus Time Measurement</b>	
RF Input Range	-50 dBm to +30 dBm
Power Ramp Relative Accuracy (typical)	±0.2 dB at 0 dBfs to -40 dBfs
Time Resolution (typical)	0.15625 μs at 5 MHz span
Marker Amplitude Resolution	0.001 dB
Burst Count	1000 maximum
<b>Modulation Spectrum Measurement</b>	
Carrier Power Range	-5 dBm to +30 dBm
Dynamic Range for GMSK Modulation (typical)	82 dB at 600 kHz offset (30 kHz RBW) 86 dB at 1.2 MHz offset (30 kHz RBW) 83 dB at 1.8 MHz offset (100 kHz RBW), 85 dB at 6 MHz offset (100 kHz RBW)
Dynamic Range for 8-PSK Modulation (typical)	82 dB at 600 kHz offset (30 kHz RBW), 85 dB at 1.2 MHz offset (30 kHz RBW), 83 dB at 1.8 MHz offset (100 kHz RBW), 83 dB at 6 MHz offset (100 kHz RBW)
Burst Count	1000 maximum
<b>Switching Spectrum Measurement</b>	
Carrier Power Range	-5 dBm to +30 dBm
Dynamic Range for GMSK Modulation (typical)	75 dB at 400 kHz offset (30 kHz RBW), 80 dB at 600 kHz offset (30 kHz RBW), 84 dB at 1.2 MHz offset (30 kHz RBW), 88 dB at 1.8 MHz offset (30 kHz RBW)
Dynamic Range for 8-PSK Modulation (typical)	75 dB at 400 kHz offset (30 kHz RBW), 80 dB at 600 kHz offset (30 kHz RBW) 84 dB at 1.2 MHz offset (30 kHz RBW) 88 dB at 1.8 MHz offset (30 kHz RBW)
Burst Count	1000 maximum

**Opt. 25 - cdma2000 1x Analysis Software**

Perform key measurement for cdma2000 forward link (3GPP2 C.S0010) and reverse link (3GPP2 C.S0011).

**Opt. 26 - 1xEVDO Analysis Software**

Perform key measurement for cdma2000 forward link (3GPP2 C.S0010) and reverse link (3GPP2 C.S0011).

**cdma2000 1x and 1xEVDO Forward and Reverse Link**

Characteristics	Forward and Reverse Link
<b>Code Domain Power</b>	
Relative Code Domain Power Accuracy, Typical	±0.075 dB
<b>QPSK EVM</b>	
Minimum Carrier Power at RF Input	-40 dBm
EVM Floor, Typical	2.0%
<b>Modulation Accuracy (composite)</b>	
Minimum Carrier Power at RF input	-40 dBm
Composite EVM Floor, Typical	2.0%
Rho (ρ)	0.999
Frequency Error Accuracy	±10 Hz + center frequency accuracy
Forward Link Timing Accuracy (τ)	±250 ns
<b>CCDF</b>	
Histogram Resolution	0.01 dB
Minimum Carrier Power at RF Input -50 dBm	-50 dBm

**Opt. 29 - WLAN 802.11 a/b/g/n Analysis**

**IEEE 802.11 Measurements**

Measurements	Measurement Contents	802.11a	802.11b	802.11g	802.11n
<b>Modulation Analysis</b>					
EVM vs. Time	EVM	X	X	X	X
	Magnitude Error	X	X	X	X
	Phase Error	X	X	X	X
Power vs. Time	—	X	X	X	X
Constellation	—	X	X	X	X
EVM vs. SC	EVM	X	X	X	X
	Magnitude Error	X	X	X	X
	Phase Error	X	X	X	X
Power vs. SC	—	X	X	X	X
SC Constellation	—	X	X	X	X
Frequency Error	—	X	X	X	X
OFDM Flatness	—	X	—	X	X (SISO only)
OFDM Linearity	—	X	—	X	X (SISO only)
Symbol Table	—	X	X	X	X
2 x 2 MIMO Signal Analysis	—	—	—	—	X
<b>Power Analysis</b>					
Transmit Power	—	—	X	X	—
<b>Transmission Analysis</b>					
Transfer Function vs. Time	—	—	—	—	X
Delay Profile vs. Time	—	—	—	—	X

# Real-Time Spectrum Analyzer Software for RTSAs

► RSAVu (RSA600A, RSA300 Series RTAs, DSA/DSO 7000 Series and TLA 5000/7000 Series)

## Opt. 30 – 3GPP Release 99 (WCDMA) and Release 5 Downlink (HSDPA) Analysis Software

## 3GPP Release 99 W-CDMA Uplink Analysis

Perform key measurements for 3GPP TS34.121 including PRACH analysis capability.

**Supports the following measurements –**  
 Constellation, EVM, Eye Diagram, Symbol Table, CDP Spectrogram, CDP vs. Short Code, CDP vs. Symbol, CDP vs. Time Slot, Symbol Constellation, Symbol EVM, Symbol Eye Diagram.

**Supports W-CDMA uplink signals –**  
 DPDCH 9 Dedicated Physical Data Channel/DPCCH (Dedicated Physical Control Channel), PRACH (Physical Random Access Data Channel), PCPCH (Physical Common Packet Channel).

## 3GPP Release 5 Downlink (HSDPA) Analysis

Perform key measurements for 3GPP TS25.141 v5.7.0.

### 3GPP-R5 Downlink

Characteristics	Description
Modulation Format	QPSK, 16QAM auto detection
Channel power measurement	
Minimum power at RF input	–50 dBm
Absolute power measurement accuracy (typical)	±0.6 dB at 20 °C to 30 °C, excluding mismatch error Signal frequency: 1900 to 2200 MHz Signal power: +10 dBm to –30 dBm after auto level is performed at 10 MHz span
Relative Power Measurement Accuracy (typical)	±0.2 dB at 20 °C to 30 °C, excluding mismatch error Signal frequency: 1900 to 2200 MHz Signal power: 0 dBm to –30 dBm after auto level is performed at 10 MHz span
Resolution	0.01 dB
<b>ACLR Measurement</b>	
Minimum carrier power at RF input	–40 dBm
Signal Type, Measurement Mode	ACLR
3GPP Downlink, 1 DPCH	Adjacent Alternate
Real-time (spec.)	–66 dB –68 dB
Stepped (typical)	–70 dB –72 dB
<b>CCDF Measurement</b>	
Histogram Resolution	0.01 dB
<b>OBW (Occupied Bandwidth) measurement</b>	
Minimum carrier power at RF input	–50 dBm
Measurement accuracy	0.2% (5 MHz Span, 1000 times averaging)
Spectrum emission mask	
Dynamic range	82 dB (30 kHz BW, Input Power >–5 dBm, 5 MHz offset)
<b>Code Domain Power</b>	
Relative accuracy of code domain power accuracy	±0.15 dB, typically ±0.075 dB Using Test Model 5, Total Power = 0 dBm, Code Level >–15 dB
QPSK EVM (Pilot Channel Only)	
Minimum carrier power at RF input	–60 dBm (EVM <9 %)
EVM floor (typical)	2.0% (Input Power >–40 dBm, 10 times averaged)
<b>Modulation Accuracy (Composite, Test Model 5)</b>	
Minimum carrier power at RF input	–60 dBm (EVM < 9%)
Composite EVM floor (typical)	2.5 % (Input Power >–40 dBm, 10 times averaged)
Frequency error accuracy	±10 Hz + (center frequency accuracy)
<b>Modulation Accuracy (Composite, Alternate Scrambling Code)</b>	
Minimum carrier power at RF input	–60 dBm (EVM <9%)
Composite EVM floor (typical)	2.5% (Input Power >–40 dBm, 10 times averaged)
Frequency error accuracy	±10 Hz + (center frequency accuracy)

## 3GPP-R5 Uplink

## Analysis

Characteristics	Description
<b>ACK/NACK Analysis</b>	
ACK/NACK Analysis Function	ACK/NACK/DTX detection, CQI decode
<b>Code Domain Power</b>	
Relative accuracy of code domain power accuracy	±0.15 dB, typically ±0.075 dB (Total Power = 0 dBm, Code Level >−15 dB)

### Opt. 40 - 3GPP Release 6 Uplink (HSUPA) Analysis Software

Perform key measurement for 3GPP TS25.141 141 V6.11.0 and TS25.101 V6.9.0 (Uplink).

## 3GPP-R6 Uplink

Characteristics	Description
Modulation Format	Channel detection, IQ split analysis
<b>Code Domain Power</b>	
Relative Accuracy of Code Domain Power Accuracy	±0.15 dB, typically ±0.075 dB Using Test Model 5, Total Power = 0 dBm, Code Level >−15 dB
<b>QPSK EVM (Pilot Channel Only)</b>	
Minimum Carrier Power at RF Input	−60 dBm (EVM <9 %)
EVM Floor (typical)	2.0% (Input Power >−40 dBm, 10 times averaged)
<b>Modulation Accuracy (Composite, Test Model 5)</b>	
Minimum Carrier Power at RF Input	−60 dBm (EVM <9%)
Composite EVM Floor (typical)	2.5 % (Input Power > −40 dBm, 10 times averaged)
Frequency Error Accuracy	±10 Hz + (center frequency accuracy)
<b>Modulation Accuracy (Composite, Alternate Scrambling Code)</b>	
Minimum Carrier Power at RF Input	−60 dBm (EVM <9%)
Composite EVM Floor (typical)	2.5% (Input Power >−40 dBm, 10 times averaged)
Frequency Error Accuracy	±10 Hz + (center frequency accuracy)

## 3GPP-R6 Uplink and Downlink

Characteristics	Description
<b>Uplink</b>	
Phase Discontinuity	Result of Phase Discontinuity in accordance with 3GPP standard TS25.101(V6.9.0) 6.8.4
Gain Ratio Over Time	Power ratio % over time
Modulation Accuracy over Time	EVM, Mag error, Phase error, PCDE, Frequency error, Origin offset, Phase discontinuity over time
<b>Uplink Signaling Analysis</b>	
HS-DPCCH Analysis	ACK/NACK/PRE/POST/DTX detection, CQI decode
E-DPCCH Analysis	RSN/E-TFCI/HAPPY decode
DPCCH	TPC, TFCI decode
<b>Downlink</b>	
Modulation Accuracy over Time	EVM, Mag error, Phase error, PCDE, Frequency error, Origin offset over time
<b>Downlink Signaling Analysis</b>	
E-RGCH (E - Relative Grant Channel) Analysis	UP/HOLD/DOWN detection
E-HICH (E-Hybrid ARQ Indicator Channel) Analysis	ACK/NACK decode
E-AGCH Analysis	AGV/AGS decode

Tektronix maintains a comprehensive, constantly expanding collection of application notes, technical briefs and other resources to help engineers working on the cutting edge of technology. Please visit [www.tektronix.com](http://www.tektronix.com)



Product(s) are manufactured in ISO registered facilities.

Product(s) complies with IEEE Standard 488.1-1987, RS-232-C, and with Tektronix Standard Codes and Formats.

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12/07 WOW

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## Real-Time Spectrum Analyzer Software for RTSAs

► RSAVu (RSA600A, RSA300 Series RTSAs, DSA/DSO 7000 Series and TLA 5000/7000 Series)

### Recommended PC Configuration

- Pentium-compatible processor: >2.4GHz, and >500 MB RAM
- Microsoft Windows XP
- 100 MB free hard-disk space
- Available USB port: Used for hardware license key

### ► Ordering Information

#### RSAVu

Offline analysis software for RSA series spectrum analyzers and DSA/DSO 70000 oscilloscopes. Basic RSAVu is free of charge on the Tektronix web site ([www.tektronix.com](http://www.tektronix.com)) and is capable of performing:

- Amplitude, frequency, and phase vs. time analysis
- Analog modulation analysis for AM, FM and PM signals
- I and Q versus time measurements
- Pulsed signal analysis

Options may be ordered which provide digital modulation analysis, for a variety of modulation types and standards. Options are delivered in the form of a USB key that is used with your PC when RSAVu is operating.

#### Options

**Opt. 21** – Offline Modulation Analysis – Advanced Measurement Suite Software.

**Opt. 24** – Offline Modulation Analysis – GSM/EDGE.

**Opt. 25** – Offline Modulation Analysis – CDMA2000/1X.

**Opt. 26** – Offline Modulation Analysis – 1x EVDO.

**Opt. 29** – Offline Modulation Analysis – IEEE 802.11a/b/g/n.

**Opt. 30** – Offline Modulation Analysis – 3GPP Release 99 (W-CDMA) and Release 5 UL/DL Analysis (HSDPA).

**Opt. 40** – Offline Modulation Analysis – HSPA 3GPP Release 6\*2.

#### RSAVuUP

Upgrades for offline analysis software. Upgrades are installed via USB key that ships with the purchased option. If you already own an RSAVu USB key, the new key will reprogram your key to activate all purchased options.

#### Upgrade Options

**Opt. 21** – Reprograms USB HW Key to add option 21 – Advanced Measurement Suite Software.

**Opt. 24** – Reprograms USB HW Key to add option 24 – GSM/EDGE.

**Opt. 25** – Reprograms USB HW Key to add option 25 – CDMA2000/1X.

**Opt. 26** – Reprograms USB HW Key to add option 26 – 1x EVDO.

**Opt. 29** – Reprograms USB HW Key to add option 29 – IEEE 802.11a/b/g/n.

**Opt. 30** – Reprograms USB HW Key to add option 30 – 3GPP Release 99 (W-CDMA) and Release 5 UL/DL Analysis (HSDPA).

**Opt. 40** – Reprograms USB HW Key to add option 40 – HSPA 3GPP Release 6.\*2

\*2 Requires Option 30.